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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/529,839	09/02/2005	Bradley P. Russell	HYI-02-104	5843
7590 01/18/2008 Nick C Kottis Pauley Petersen & Erickson Suite 365 2800 West Higgins Road Hoffman Estates, IL 60195			EXAMINER SEIFU, LESSANEWORK T	
			ART UNIT 1797	PAPER NUMBER
			MAIL DATE 01/18/2008	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/529,839

Applicant(s)

RUSSELL ET AL.

Examiner

Lessanework T. Seifu

Art Unit

1797

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 31 March 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 1-14 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 15-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 31 March 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>09/02/05</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Restriction is required under 35 U.S.C. 121 and 372.

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1.

In accordance with 37 CFR 1.499, applicant is required, in reply to this action, to elect a single invention to which the claims must be restricted.

Group I, claim(s) 1-9, drawn to process for generating hydrogen.

Group II, claim(s) 10-12, drawn to a hydrogen generator.

Group III, claim(s) 13 and 14, drawn to an apparatus for removing sulfur compounds from a hydrocarbon-containing gas stream.

Group IV, claim(s) 15-20, drawn to a process for removal of sulfur compounds from a hydrocarbon stream containing the same.

2. The inventions listed as Groups I - IV do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

The technical feature linking the four groups of inventions is the feature of a bed of solid sorbent for the removal of sulfur compounds from hydrocarbon feeds. The above technical feature is described in the prior art by Young et al. (US 4,455,286). Young et al. disclose a regenerable solid sorbent material capable of removing sulfur compounds from a fuel gas mixture at temperature compatible with high-temperature

fuel cell use (see col. 1, lines 42-48). Satokawa et al. (US 2001/0014304) also disclose an adsorbent for removing sulfur compounds from hydrocarbon stream containing sulfur compounds (see parag. [0027]). Accordingly, the four groups of invention lack general inventive concept that defines a contribution over the prior art.

3. During a telephone conversation with Nick Kottis on January 15, 2008 a provisional election was made with traverse to prosecute the invention of Group IV, claims 15-20. Affirmation of this election must be made by applicant in replying to this Office action. Claims 1-14 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

4. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 18-20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The claims are rejected because claim 18 recites sulfur compounds, including "...CXS..." in the second line of the claim. The element "X" is not defined by the claim which renders the claim indefinite.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

9. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

10. Claims 15-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Woodward (WO 03/011436) in view of Satokawa et al. (US 2001/0014304).

Regarding claims 15-17 Woodward teaches a process for removal of sulfur compounds from a fluid streams, including hydrocarbon streams such as natural gas, containing carbonyl sulfide comprising:

- a) providing a fluid stream (hydrocarbon-containing gas) containing at least 3 moles of water per mole of carbonyl sulfide (see pg. 2, lines 16-31),
- b) contacting the stream at any convenient pressure and temperature including a temperature of about 20° to 200°C with hydrolysis catalyst to hydrolyze the carbonyl sulfide to hydrogen sulfide for a time sufficient to produce a product with no detectable carbonyl sulfide (see pg. 3 lines 1-10 and the example Table), wherein the hydrolysis catalyst comprises at least alumina having a BET surface area over 100 square meters per gram,
- c) contacting the stream having reduced COS content with a solid sorbent capable of sorbing hydrogen sulfide, the contacting being at any convenient pressure and temperature including a temperature of about 20° to 200°C for a time sufficient to produce a product with no detectable hydrogen sulfide (see pg. 3 lines 1-10).

Woodward is silent with respect to the solid sorbent being tolerant of water or being capable of sorbing organosulfur compound. Satokawa et al. disclose an adsorbent for removing sulfur compounds-containing fuel gas comprising zeolite ion exchanged with one or more transition metals (see parag. [0016]). Satokawa et al. disclose that the adsorbent of their invention is moisture (water) tolerant and capable of sorbing organosulfur compounds and sulfides (see parag. [0032]).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have combined the teachings of Woodward and Satokawa et al, and used the adsorbent of Satokawa et al. in the process of Woodward, because Satokawa et al. disclose that the adsorbent of their invention is capable of removing not only organosulfur compounds but also sulfides from fuel gases containing sulfur at or near the vicinity of room temperatures including a temperature of less than 50°C (see parag. 0026).

11. Claims 18-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Satokawa et al. (US 2001/0014304) in view of Woodward (WO 03/011436).

Regarding claim 18, Satokawa et al. disclose a process for removal of sulfur compounds, including organosulfur compound, and sulfides, from a hydrocarbon stream comprising: contacting the stream under sorption conditions including a temperature of less than about 50°C (see parag. [0026] and [0031]) with a solid

sorbent tolerant of moisture (water) and capable of sorbing organosulfur compound. Satokawa et al. further disclose that the adsorbent of their invention can effectively reduce the concentration of sulfur compounds, which includes organosulfur compounds and sulfides, in a fuel gas from about 2 ppm to a concentration of 7 ppb or below (see parag. [0029]). Satokawa et al. are however silent with respect to the adsorbent being capable of removing carbonyl sulfide.

Woodward teaches a process for removal of sulfur compounds from a fluid streams, including hydrocarbon streams such as natural gas, containing carbonyl sulfide comprising: providing a fluid stream (hydrocarbon-containing gas) containing at least 3 moles of water per mole of carbonyl sulfide (see pg. 2, lines 16-31); contacting the stream at any convenient pressure and temperature including a temperature of about 20° to 200°C with hydrolysis catalyst to hydrolyze the carbonyl sulfide to hydrogen sulfide for a time sufficient to produce a product with no detectable carbonyl sulfide (see pg. 3 lines 1-10 and the example Table); contacting the stream having reduced COS content with a solid sorbent capable of sorbing hydrogen sulfide, the contacting being at any convenient pressure and temperature including a temperature of about 20° to 200°C for a time sufficient to produce a product with no detectable hydrogen sulfide (see pg. 3 lines 1-10), wherein the hydrogen sulfide sorbent comprises at least one of zinc hydroxycarbonate, zinc oxide, iron oxide, iron hydroxycarbonate and copper oxide. Woodward further discloses that the hydrogen sulfide adsorbent can further contain alumina (see page. 2, lines 6-10).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have combined the teachings of Woodward and Satokawa et al, for the purpose of removing carbonyl sulfide according to the teachings of Woodward, because, Woodward discloses that the process of his invention is beneficial to the performance of a sulfur sensitive catalyst in a down-steam operation (see pg. 3, lines 4-13).

Conclusion

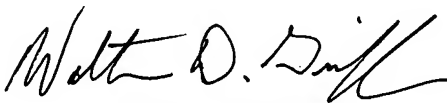
12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Brownell et al. (US 4,455,446) disclose method of removal of Carbonyl sulfide from a hydrocarbon fluid stream containing the same by using a hydrolyzing catalyst. The reference discloses that for the method to be practical and successful, there should be present in the fluid or the hydrolyzing catalyst bed a small amount of water at least double the stoichiometric amount of the carbonyl sulfide to be hydrolyzed. Dao et al. (US 5,674,463) teach that sulfur compounds such as carbonyl sulfide and hydrogen sulfide can be removed from a gas stream by a process comprising: a first step in which carbonyl sulfide is hydrolyzed to hydrogen sulfide by contacting the gas stream with water vapor in the presence of an hydrolysis catalyst; and a second step in which hydrogen sulfide in the gas stream is removed from the gas stream in a presence of a sorbent (see col. 2, lines 11-30).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lessanework T. Seifu whose telephone number is 571-270-3153. The examiner can normally be reached on Mon-Thr 7:00am-5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Walter Griffin can be reached on 571-272-1447. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

LS


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